1049.01

Industrial Exposure and Control Technologies for OSHA Regulated Hazardous Substances

U.S. Department of Labor
Elizabeth Dole, Secretary
March 1989

Volume I of II
Substances A-I

Occupational Safety and Health Administration
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Chromium (II) and (III) compounds
(CAS NUMBER: VARIES ACCORDING TO COMPOUND)

SYNONYMS

Synonyms vary depending upon specific compound.

TRADE NAMES

NONE

DESCRIPTION OF SUBSTANCE

Divalent chromium compounds (Cr (II)) include chromous chloride and chromous sulfate. Trivalent chromium compounds (Cr (III)) include chromic oxide, chromic sulfate, chromic chloride, chromic potassium sulfate, and chromite ore.

HEALTH EFFECTS

Early studies indicate that divalent and trivalent chromium compounds have a low order of toxicity. Dermatitis has been reported in workers handling drivalent chromium compounds. [ACGIH, P. 139, 1986]
Chest roenthenograms are said to have revealed only "exaggerated pulmonic markings" in workers exposed to chromite dust. The lungs of other workers exposed to chromite dust have been shown to be the seat of pneumoconiotic changes consisting of slight thickening of interstitial tissue, interalveolar septa, histologic fibrosis, and hyalinization. A refractory plant using chromite ore to make chromite brick had no excess of lung cancer deaths over a 14-year period, and it was concluded that chromite alone probably is not carcinogenic. [PROCTOR AND HUGHES, P. 175, 1978]
There is no evidence that trivalent chromium (the most common form found in nature and probably always the form of chromium contained in biologic materials) is converted to hexavalent forms in biologic systems, according to 'Casarett and Doull's Toxicology', third edition, 1986, p. 597. However, a study cited in 'Environmental and Occupation Medicine' (1983, p. 491) concludes that trivalent chromium may be converted to the hexavalent form in the intestines, depending on the pressure of functional abnormalities. Trivalent chromium compounds are considerably less toxic than the hexavalent compounds and are neither irritating nor corrosive. Nevertheless, nearly all workers in industries are exposed to both forms of chromium compounds, and at present, there is no information as to whether there is a gradient of risk from predominant exposure to the hexavalent or insoluble forms of chromium to exposure to the soluble trivalent forms. A recent review (Norseth, T.: The carcinogenicity of chromium. Environ. Health Perspect., 40: 121-30, 1981) suggests that is there are similar increased risks in both groups, as estimated from the death rates, trivalent

chromium should be considered as potent a carcinogen as the hexavalent compounds. [CASARETT AND DOULL'S TOXICOLOGY, P. 598, 1986]

TOXICITY/EXPOSURE LIMITS

NFPA RATING - NONE

TOXICITY HAZARD RATING - Varies according to specific compound.

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH - NONE

OSHA PEL - 0.5 mg/m3;TWA

ADOPTED ACGIH/TLV - 0.5 mg/m3;TWA - as Cr

NIOSH/REL - NONE

INDUSTRY USE DATA

Chromium metal is used to manufacture stainless and heat-resisting steel and alloy steel. Chromium and its compounds are also used in refractories, drilling muds, the production of chromic acid and specialty chemicals; as a constituent of inorganic pigments, a sensitizer in the photographic industry, electroplating cleaning agents in the metal finishing industry, mordants in the textile industry; in nuclear and high-temperature research, in catalytic manufacture, and in fungicides and wood preservatives.

NIOSH 1982 NATIONAL OCCUPATIONAL EXPOSURE SURVEY

SIC CODE	INDUSTRY NAME	TOTAL ON PAYROLL	TOTAL EXPOSED	PERCENT EXPOSED
3324	STEEL INVESTMENT FOUNDRIES	527	96	18.22

NIOSH 1972 NATIONAL OCCUPATIONAL HAZARD SURVEY

SIC CODE	INDUSTRY NAME	TOTAL ON PAYROLL	TOTAL EXPOSED	PERCENT EXPOSED
3623	WELDING APPARATUS	605	71	11.74
3263	FINE EARTHENWARE FOOD UTENSIL	142	16	11.27
3339	PRIMARY NONFERROUS METALS, NE	528	35	6.63

OSHA/EXPOSURE DATA

NONE

ENGINEERING CONTROLS

General ventilation; local exhaust ventilation; hood; enclosure of process or worker.

PERSONAL PROTECTIVE EQUIPMENT

Respiratory protection should be as follows: Chromium metal and insoluble salts: be necessary Up to 2.5 mg/m3: any dust and mist respirator except single-use respirators. Substance reported to cause eye irritation or damage; may require eye protection. Up to 5 mg/m3: any dust and mist respirator except single-use and quarter-mask respirators or supplied air respirator or self-contained breathing apparatus. Substance reported to caus e eye irritation or damage; may require eye protection. Up to 12.5 mg/m3: any powered air-purifying respirator with dust, mist filter; or any supplied-air respirator operated in a continuous flow mode. Substance reported to cause eye irritation or damage; may require eye protection. Up to 25 mg/m3: any air-purifying respirator with a high efficiency particulate filter or any powered air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter. Substance reported to cause eye irritation or damage; may require eye protection. Any self-contained breathing apparatus with a full facepiece or any supplied-air respirator with a full facepiece. Up to 500 mg/m3: any supplied-air respirator with a full facepiece and operated in a pressure-demand or other positive pressure mode. Emergency or planned entry in unknown concentration or IDLH conditions: any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode or any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus and operated in pressure-demand or other positive pressure mode. Escape: any air-purifying full facepiece respirator with a high-efficiency particulate filter or any appropriate escape-type self-contained breathing apparatus. [NIOSH: POCKET GUIDE TO CHEMICAL HAZARDS P. 83 (1987) DHEW (NIOSH) PUB NO. 85-114]
Chromium: soluble chromic and chromous salts: Up to 2.5 mg/m3: any dust and mist respirator except single-use respirators. Substance reported to cause eye irritation or damage; may require eye protection. Up to 5 mg/m3: any dust and mist respirator except single-use and quarter-mask respirators or supplied air respirator or self-contained breathing apparatus. Substance reported to caus e eye irritation or damage; may require eye protection. Up to 12.5 mg/m3: any powered air-purifying respirator with dust, mist filter; or any supplied-air respirator operated in a continuous flow mode. Substance reported to cause eye irritation or damage; may require eye protection. Up to 25 mg/m3: any air-purifying respirator with a high efficiency particulate filter or any powered air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter. Substance reported to cause eye irritation or damage; may require eye protection. Any

self-contained breathing apparatus with a full facepiece or any supplied-air respirator with a full facepiece. Up to 250 mg/m3: any supplied-air respirator with a full facepiece and operated in a pressure-demand or other positive pressure mode. Emergency or planned entry in unknown concentration or IDLH conditions: any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode or any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus and operated in pressure-demand or other positive pressure mode. Escape: any air-purifying full facepiece respirator with a high-efficiency particulate filter or any appropriate escape-type self-contained breathing apparatus. [NIOSH: POCKET GUIDE TO CHEMICAL HAZARDS P. 85 (1987) DHEW (NIOSH) PUB NO. 85-114]

STORAGE

NONE